GEOLOGIC CHARACTERIZATION OF LAKE WAUBERG
ALACHUA COUNTY, FLORIDA

By

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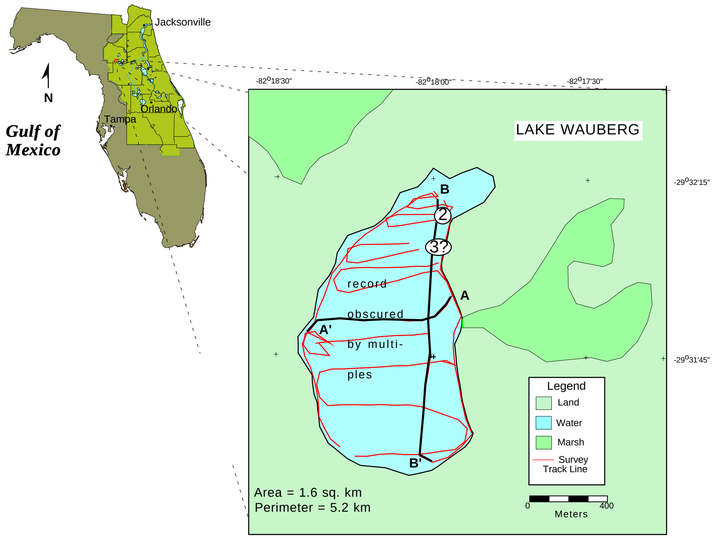


INTRODUCTION

The potential fliud exchange between lakes of northern Florida and the Floridan aquifer and the process by which exchange occurs is of critical concern to the St. Johns River Water Management District (SJRWMD). High-resolution seismic tools with relatively new digital technology were utilized in collecting geophysical data from > 40 lakes and rivers. The data collected shows the application of these techniques in understanding the formation of individual lakes and rivers, thus aiding in the management of these natural resources by identifying breaches or areas where the confining units are thin or absent between the water bodies, the Intermediate aquifer and the Floridian aquifer.

This study was a cooperative investigation conducted from 1993 to 1996 by the SJRWMD and U.S. Geological Survey Center for Coastal Geology (USGS). Since 1989 there have been technical and hardware advances in the digital acquisition of high-resolution seismic data. The primary objective of this cooperative was to test newly developed digital high-resolution single-channel marine seismic continuous-profiling-equipment (HRSP) and apply this technology to identify subbottom features that may enhance leakage from selected lakes and the St. Johns River. The target features include: (1) identifying evidence of breaches or discontinuities in the confining units between the water bodies and the aquifer, and; (2) identifying areas where the confining unit is thin or absent.

METHODS

In cooperation with SJRWMD the USGS acquired and upgraded a digital seismic acquisition system. The Elics Delph2 High-Resolution Seismic System was acquired with proprietary hardware and software running in real time on an Industrial Computer Corp. 486/33 PC. Hard-copy data was displayed on a gray scale thermal plotter. Digital data was stored on a rewritable Magneto-Optical compact disk. Navigation data was collected using a Trimble GPS or PLGR (Rockwell) GPS. GeoLink XDS mapping software was used to display navigation.

The acoustic source was the Huntec Model 4425 Seismic Source Module and a catamaran sled with an electromechanical device. Occasionally, an ORE Geopulse power supply was substituted for the Huntec Model 4425. Power was set at 60 joules or 135 joules depending upon conditions. An Innovative Transducers Inc. ST-5 multi-element hydrophone was used to detect the return acoustical pulse. This pulse was fed directly into the Elics Delph2 system for storage and processing.

Forty-four line-km of HRSP data was collected from Lake Disston. A velocity of 1500 meters per second (m/s) was used to calculate a depth scale for the seismic profiles. Measured site specific velocity data is not available for these sites.

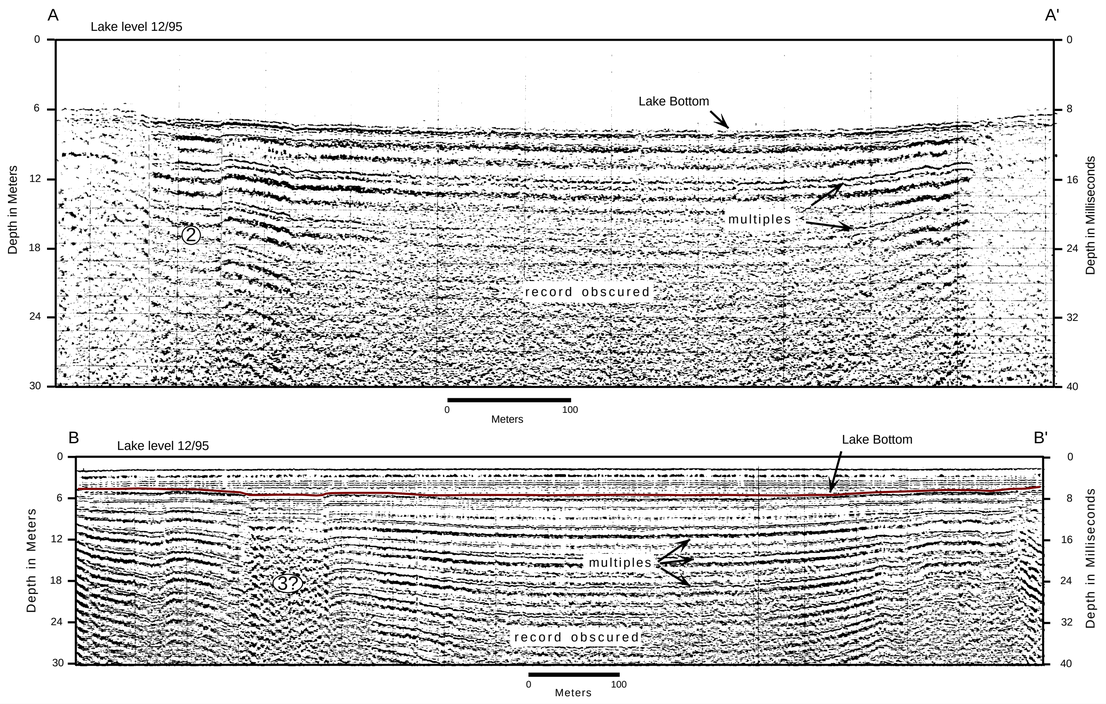
These surveys were conducted in part to test the effectiveness of shallow-water marine geophysical techniques in the freshwater lakes of central Florida. Acquisition techniques were similar but modifications were necessary. Data quality varied from good to poor with different areas and varying conditions. As acquisition techniques improved so did data quality in general. In many areas an acoustic multiple masked much of the shallow geologic data.

Physiography

Lake Wauberg is located south of Paynes Prairie in central Alachua County. The lake is in the Ocala Uplift District, situated between the forested highlands of the Fairfield Hills area and the surrounding dissolution valleys of the Alachua Prairies. Lake Wauberg is irregular in shape, covering 1.6 square kilometers with about 5 kilometers of shoreline. The lake is adjoined to the east by Sawgrass Pond. A marshy area to the northwest (index map) is separated from the lake by a relative high.

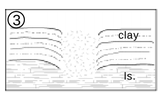
GEOLOGIC CHARACTERIZATION

The seismic reflection record acquired from Lake Wauberg is predominantly obscured by strong multiples. In Figure A-A' the multiples appear to be originating from the lake bottom. It is also possible that the multiples may be originating from a hard surface very near the lake bottom as is apparent in Figure B-B'. Typically, strong surface multiples are the result of ringing off of hard sands comprising the lake bottom. Scott, 1988, describes the Coosawhatchie Formation to be near the surface in this area (125-150 feet NVGD). The upper member of this formation is typically sandy to very sandy dolostone, which could provide an acoustically hard surface. Very little can be seen below the surface in most of the profiles. ADD WEINER, 1982 STUDY.



EXPLANATION

Undisturbed section with areas obscured by noise created by muck or aquatic vegetation dispersing the acoustic signal.



Horizontal reflectors continuous on either side of a central non-reflective zone. Horizontal layers bend downward towards the central zone. These features are representative of filled collapse sinks. The size may range from tens of meters to kilometers across a lake basin.